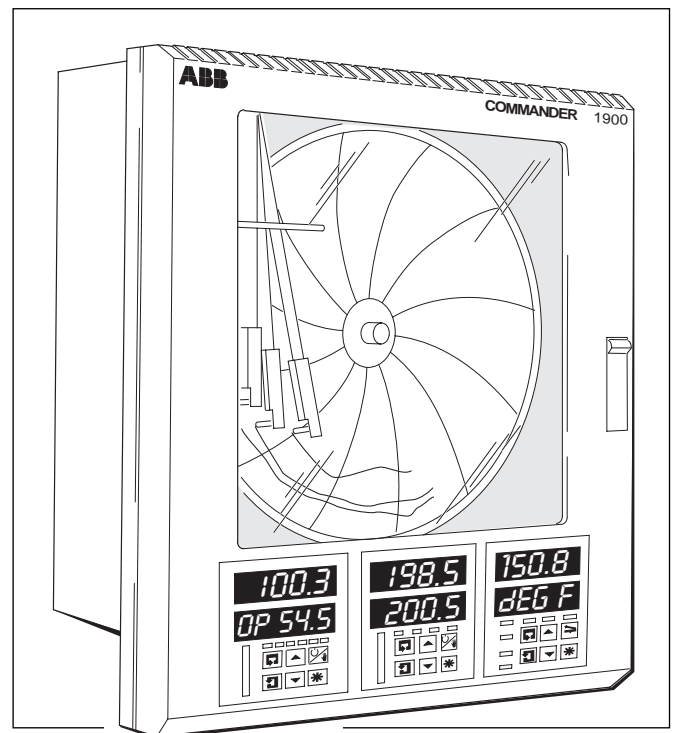


### *Specification DataFile*

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- **1 to 4 pen recording**
  - full application flexibility
- **1 or 2 controllers**
  - integrated control and recording
- **PID autotune on demand**
  - optimum loop control
- **20 programmable ramp/soak profiles**
  - multiple recipe capability
- **NEMA 4X / IP66 construction**
  - hose-down protection
- **0.1% measurement accuracy**
  - precise process information
- **RS485 MODBUS serial communications**
  - open system compatibility



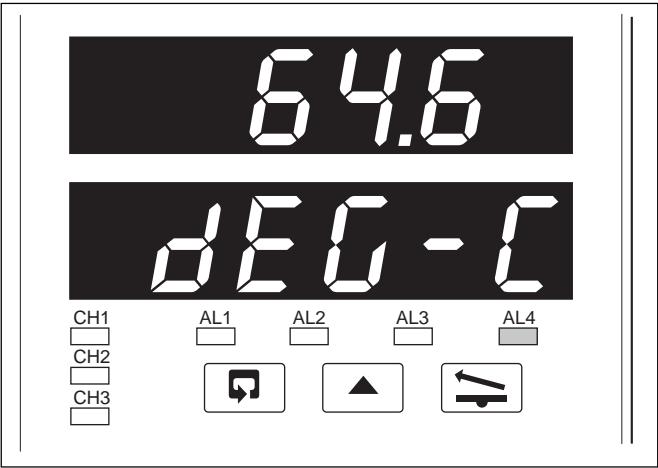
*COMMANDER 1900 –  
dependable recording and full  
PID control united in a rugged,  
functional instrument.*

# COMMANDER 1900

The COMMANDER 1900 is a fully programmable circular chart recorder/controller combining two PID control loops with 4-pen recording. The COMMANDER's straightforward operator controls and robust construction make it suitable for a variety of industrial environments. Excellent standard facilities are complemented by a powerful range of options to give the flexibility to match your application.

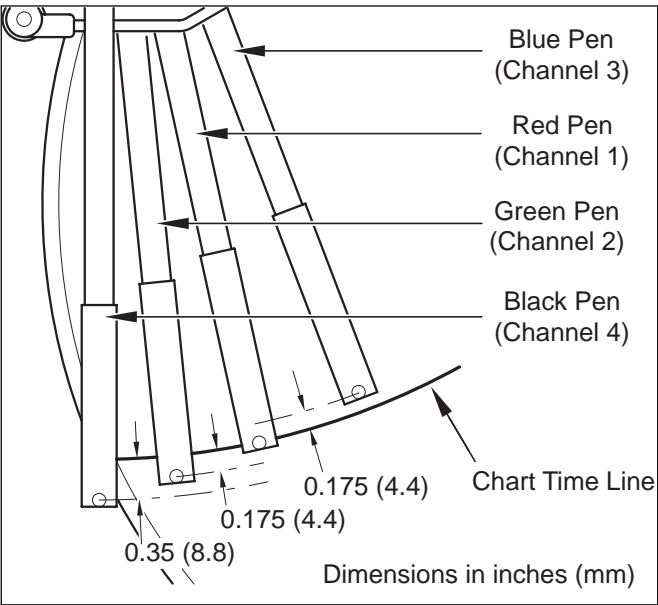
## Comprehensive Process Information

The COMMANDER lets you see the status of your process at a glance: **high visibility 6-digit LED displays** provide a clear indication of all process signals. Dedicated operator stations for each controller give continuous displays of set points, measured values and high-visibility deviation bargraphs. Active alarms are signalled by flashing LEDs below the main displays. Active alarms are signalled by flashing LEDs below the main displays.



## 4-pen Recording

The chart is easily set up to show the information you need in the way you want. Pen ranges are individually set to give the best resolution for each signal; additionally, a **true-time event pen** facility enables one pen to be set up as a 3-position event marker on the same time line as Pen 1.



## Straightforward Operation

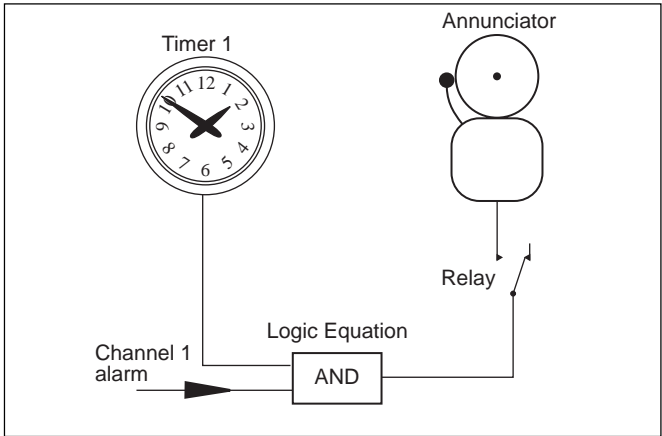
The clearly-labelled **tactile keypads** permit operator adjustments and configuration programming without the need to open the recorder's door. Separate operator panels for each controller provide a direct route for accessing individual control loops. Clear text prompts on the digital displays guide the user around the various menus. A **password-protected security system** prevents unauthorized access to configuration adjustment menus.

## Flexibility to Solve Problems

The COMMANDER 1900 offers seamless integration of loop functionality to solve process problems, eliminating the need for auxiliary devices.

## Totalizers, Math, Logic and Timers

Integrating fluid flow to calculate total volume is performed by the **built-in totalizers**, available for each channel. Relays can be assigned to increment or reset external counters to match the recorder's totalizer values.

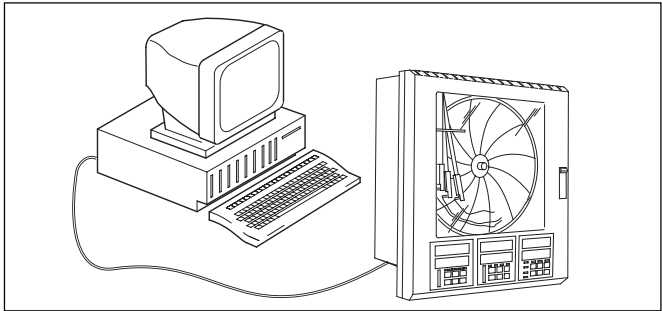


Alarm annunciation enabled during night hours only

User configurable **math functions**, mass flow calculations, RH tables and **logic equations** are all fully supported. The COMMANDER also offers two event timers driven by the recorder's **real-time clock**.

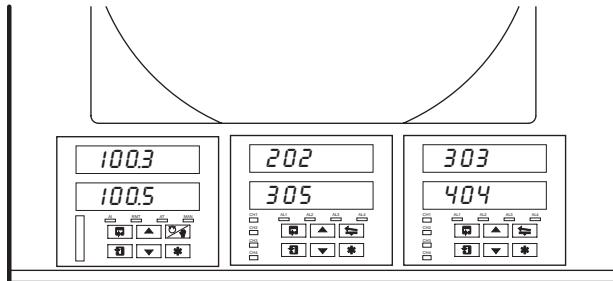
## MODBUS RS485 Communications

Communications with PCs or PLCs are achieved via the RS485 serial communications link. Using MODBUS RTU protocol, all process inputs and other variables can be continuously read by a host PC running any of a wide variety of standard SCADA packages.



## Versatile Process Control

The COMMANDER 1900 provides full PID control of one or two process loops in addition to its powerful recording facilities. The control loops can operate independently or be soft-linked together to implement Cascade or Master/Slave control strategies. Each loop has a dedicated  $\frac{1}{4}$  DIN-style operator panel for ease of operation and clarity of display.



## Analog, Relay or Valve Positioning Output

The control output is selectable to fit any application with a choice of analog, time proportioning or valve positioning relays; use of a **feedback potentiometer** to ensure precise valve control is fully supported. Heat/cool operation is available on both loops.

## Autotune

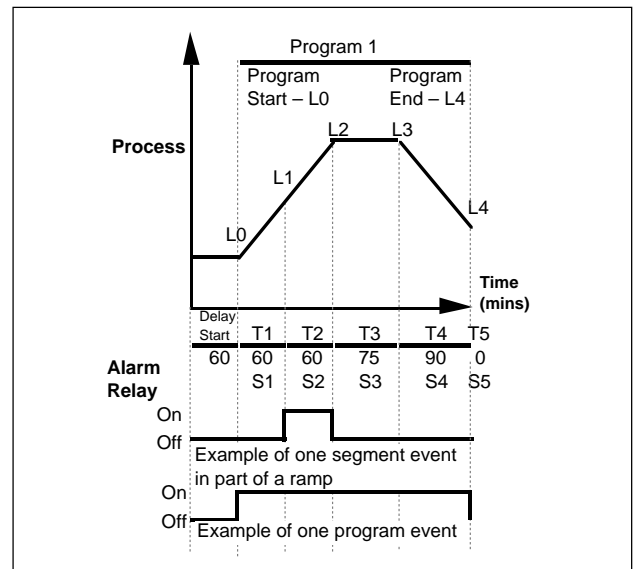
Operation of the autotune function on either loop instigates a tuning routine which allows the COMMANDER to calculate the optimum PID parameters for that particular loop. Following the completion of autotune, the PID values are automatically updated.

## Auto/Manual and Local/Remote

Dedicated membrane keys on each operator panel enable one-touch operation for selection between manual and automatic loop control and for switching from local to remote set point.

## Extensive Ramp/Soak Programming

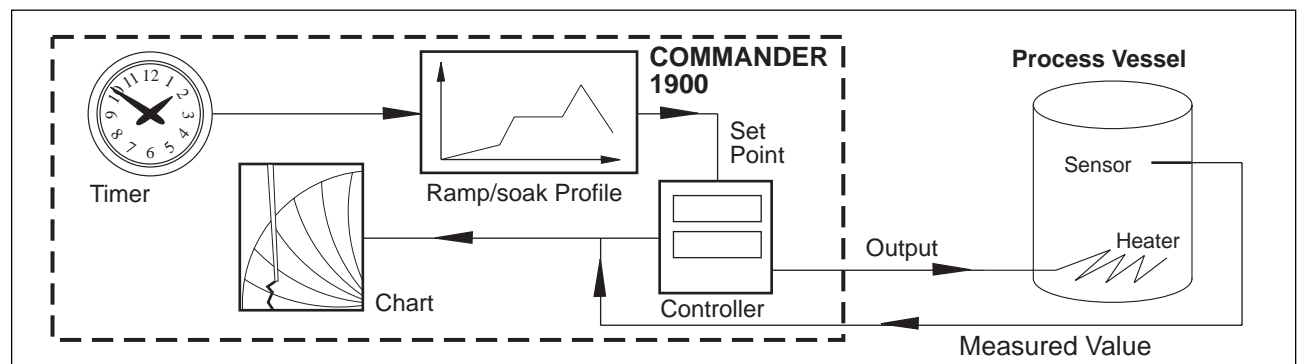
Full control of temperature profiles is provided by 10 program recipes for each controller. A total of **99 ramp/soak segments** are available for allocation to these programs. Segment events can be incorporated into the recipes to perform specific functions (e.g. operate relays) at predefined points within the program.



*Ramp/Soak Program with Time Event Relay Sequences*

## Remote Program Selection

External panel switches can be connected to the COMMANDER's digital inputs to allow remote selection of stored profiles and to initiate ramp/soak programs.



*Programmed process warm-up triggered by real-time clock*

## Built to Meet Your Needs

The COMMANDER's modular architecture gives a high level of hardware choice: up to five i/o modules can be added to the basic instrument.

The **standard input/output** module supplied with every pen comes complete with a fully isolated analog input, a relay output, transmitter power supply, isolated analog output and two digital inputs. Further input and output capability is provided by a range of plug-in modules:

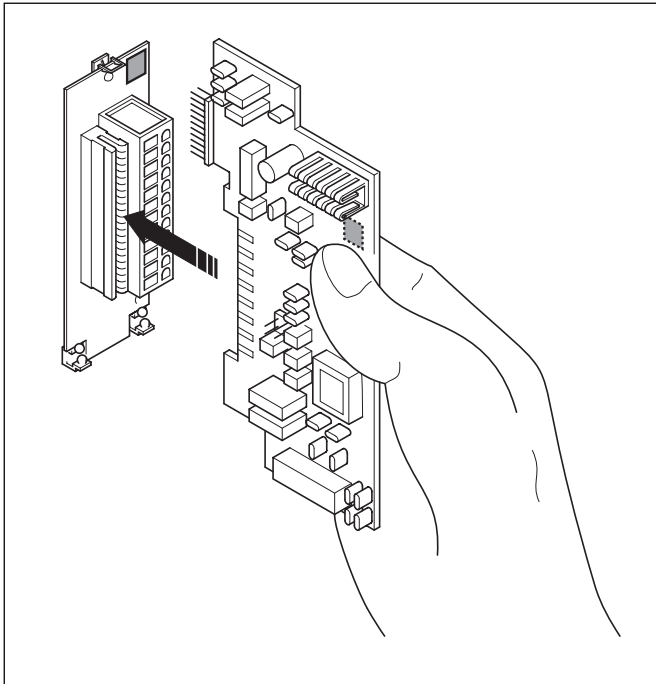
- **Analog input and relay** – remote set point
- **Four relays** – channel alarm outputs
- **Eight digital inputs** – linked using logic equations
- **Eight digital outputs** – TTL level alarm outputs
- **MODBUS RS485 communications** – interfaces with P.C.s

## Expandable for the Future

The COMMANDER may be quickly upgraded to meet your changing process requirements.

Additional recording channels, math capability or input and output functions can be retrofitted on-site using plug-in cards and easily fitted pen arms. Input calibration data is stored on each card, allowing quick changes to input cards without the need for recalibration.

Changes to input sensors or recording procedures are accommodated by reconfiguration using the main keypad.



## Minimal Maintenance

Excellent long-term stability keeps recalibration to a minimum, cutting the costs of ownership. User-selectable chart speeds and long-life pens combine to limit usage of consumables.

## Designed to Survive

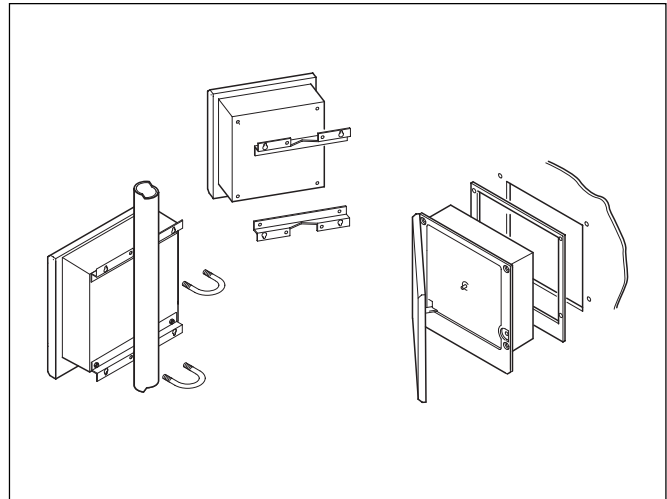
NEMA 4X protection ensures the COMMANDER can survive in the harshest environments and makes the recorder ideal for use in panels which are regularly hosed down. The tough, acid-resistant case and secure cable-entry glands maintain the NEMA 4X rating for wall-mounted or pipe-mounted instruments.

## Noise Immunity

Recording accuracy is maintained in noisy industrial environments due to the advanced EMC shielding within the recorder. The power supply has been designed to give excellent protection from power spikes and brownouts and all configuration and status information is held in nonvolatile memory to ensure rapid recovery after a power failure.

## Easy to Install

A choice of mounting options enables simple installation of the recorder in a panel, on a wall or on a pipe. Detachable terminal blocks allow for trouble-free connection of input and output wiring, with mains isolation provided by an optional power switch within the instrument.



## Built-in Quality

The COMMANDER 1900 is designed, manufactured and tested to the highest quality standards, including ISO 9001, and is guaranteed by a 2 year parts and labour warranty.

## Specification

### Summary

1, 2, 3 or 4 pens  
 1 or 2 PID control loops  
 10" Chart size  
 Standard i/o with each pen includes:  
 Analog input, analog output, transmitter  
 power supply, relay output and 2 digital inputs.

### General

#### Construction

Size: 15.23"(h) x 15.04"(w) x 5.57"(d)  
 (386.8 x 382.0 x 141.5mm)  
 Weight: 18lb (8.2kg)  
 Case material: Glassfiber-filled reinforced polyester  
 Window Material: Polycarbonate  
 Door latch: High-compression with optional lock

#### Environmental

Operational temperature range: 32° to 130°F (0° to 55°C)  
 Operational humidity range: 5 to 95%RH  
 (non-condensing)  
 5 to 80%RH (chart only)  
 Case sealing: NEMA 4X (IP66)  
 Fast transients: IEC 801-4 Level 3

#### Installation

Mounting options: Panel, wall or pipe  
 Terminal type: Screw  
 Wire size (max): 14 AWG (i/o), 12 AWG (power)

#### Operation and Configuration

Programming method: Via front panel keys  
 Security: Password protected menus

#### Safety

General safety: IEC348  
 Isolation: 500V dc (channel/channel)  
 2kV dc (channel/ground)  
 Memory protection: Nonvolatile EEPROM  
 Approvals: CSA (optional)  
 CE (optional)

### Power Supply

Voltage: 115/230V ac  $\pm 15\%$ , 50/60Hz  
 Consumption: < 40VA (typical for full spec. unit)  
 Line interruption: Up to 60ms

### Process Inputs and Outputs

#### General

Noise Rejection: Common mode > 120dB at 50/60Hz  
 Normal (series) mode > 60dB at 50/60Hz  
 CJC rejection ratio: 0.05°C/°C

Sensor break protection: Upscale or downscale drive  
 Out of range detection: 0 to 100% of engineering span  
 Temperature stability: < 0.02% of reading/°C or 1 $\mu$ V/°C  
 Long-term drift: < 0.01% of reading 10 $\mu$ V annually  
 Input impedance: > 10 M $\Omega$  (mV and V inputs)  
 100  $\Omega$  (mA inputs)

#### Analog Inputs

Signal types: mV, V, mA,  $\Omega$   
 Thermocouple types: B, E, J, K, N, R, S, T  
 Resistance Thermometer: Pt100  
 Other linearizations: x  $1/2$ , x  $3/2$ , x  $5/2$ , linear  
 Sample interval: 250ms per channel  
 Isolation: 500Vdc channel/channel  
 Digital Filter: 0 to 60s programmable

#### Transmitter Power Supply

Number: 1 per channel  
 Voltage: 24Vdc nominal  
 Drive: Up to 25mA  
 Isolation: 500Vdc channel/channel

#### Analogue Outputs

Type: 4 to 20 mA  
 Accuracy:  $\pm 0.1\%$   
 Maximum load: 750  $\Omega$   
 Isolation: 500V dc

#### Relay Outputs

Type: SPDT  
 Rating (with non-inductive load): 5A at 115/230Vac

### Analog Input Performance

Type	Range Lo	Range Hi	Min. Span	Accuracy
mV	0	150	5	$\pm 0.1\%$ reading or 10 $\mu$ V
V	0	5	0.1	$\pm 0.1\%$ reading or 20 $\mu$ V
mA	0	50	1	$\pm 0.2\%$ reading or 0.2 $\mu$ A
Ohms (high)	0	10k	400	$\pm 0.5\%$ reading or 0.1ohm
Ohms (low)	0	10k	400	$\pm 0.5\%$ reading or 10ohm

Type	°C			°F			Accuracy (excl. CJC)
	Range Lo	Range Hi	Min. Span	Range Lo	Range Hi	Min. Span	
B	-18	1800	1278	0	3270	710	$\pm 2.0^\circ\text{C}$ (above 200°C)
E	-100	900	81	-140	1650	45	$\pm 0.5^\circ\text{C}$
J	-100	900	90	-140	1650	50	$\pm 0.5^\circ\text{C}$
K	-100	1300	117	-140	2350	65	$\pm 0.5^\circ\text{C}$
N	-200	1300	162	-325	2350	90	$\pm 0.5^\circ\text{C}$
R	-18	1700	576	0	3000	320	$\pm 1.0^\circ\text{C}$ (above 300°)
S	-18	1700	576	0	3000	320	$\pm 1.0^\circ\text{C}$ (above 200°C)
T	-250	300	108	-400	550	60	$\pm 0.5^\circ\text{C}$
PT100	-200	600	45	-325	1100	25	$\pm 0.5^\circ\text{C}$

## Digital Inputs

Type: TTL or volt-free  
Minimum pulse: 250ms  
Isolation: 500Vdc between modules, no isolation within module

## Digital Outputs

Type: 5V TTL  
Rating: 5mA per output  
Isolation: 500Vdc between modules, no isolation within module

## Serial Communications

Connections: RS485, 4 wire  
Protocol: MODBUS RTU

## Pneumatic inputs/outputs

Type: 3 to 15 psig I/P, 3 to 15 psig P/I  
Mounting: External DIN rail on rear of unit

## Recording System

### Pens

Number: 1, 2, 3, or 4 (red, blue, green, black)  
Response: 7 seconds (full scale)  
Resolution: 0.1% steps  
Pen lift: Motor-driven, with optional auto-drop

### Event Pens

Standard: 3-position event recording on any channel  
Real time: 3-position event recording on the same time line as Pen 1

### Chart

Chart size: 10" or 105mm  
Chart speed: 1 to 167 hours or 7 to 32 days per revolution

## Display and Operator Panels

### Displays

Number: Dual display for process value and set point for each controller, plus individual display for each record-only channel  
Type: 6-digit red LED, 0.56" (14mm) high  
Status indicators: Indicate channel number on display (on record-only chan.)  
Indicate remote set point, autotune or manual operation  
Alarm indicators: Indicate channels with active alarms

### Panel keys

Function: Programming access, increment/decrement, auto/manual, pen lift and user-defined function key.

## Alarms and Logic

### Alarms

Number: 4 per channel  
Type: High/low process, fast/slow rate of change, deviation high/low, output high/low  
Adjustments: Hysteresis, time delay

### Logic Equations

Number: 8  
Function: OR, AND  
Inputs: Alarm states, digital inputs, totalizers, logic  
Outputs: Relays, digital outputs, chart stop, alarm acknowledge

## Advanced Software Functions

### Totalizers

Number: 1 per pen  
Size: 99,999,999 max.  
Output: External counter driver, "wrap" pulse signal

### Math

Number of eqns.: 4  
Type: +, -, x, ÷, low & high select, max., min, average, mass flow, RH

### Timers

Number: 2  
Type: Real-time clock driven event, adjustable duration  
Output: Relay, digital output, logic equation

### PID Control

No. of loops: 1 or 2  
Control outputs: Relay, logic or dc analog  
Control types: Time-proportioning, analog  
Control action: PID, on/off, motorised valve position, boundless  
Autotune: On demand, at start-up or at set point

### Option Modules

Number: 5 plus 1 x standard input/output module  
Connection: Plug in cards with detachable connection blocks

### General

All modules isolated from each other 500V d.c.

### Module specific

Analog O/P isolated from all other I/Ps and O/Ps  
Common of digital I/Ps not isolated from -ve of PV I/P.

Option Module Types	i/o per module							Max. No. per instrmt
	Analog i/p	Analog o/p	Trans. PSU	Relays	Digital i/p	Digital o/p	Comms.	
Standard i/o	1	1	1	1	2			3
Analog i/p + relay	1			1				5
4 relays				4				2
8 digital i/p					8			3
8 digital o/p						8		3
RS485 comms.							1	1

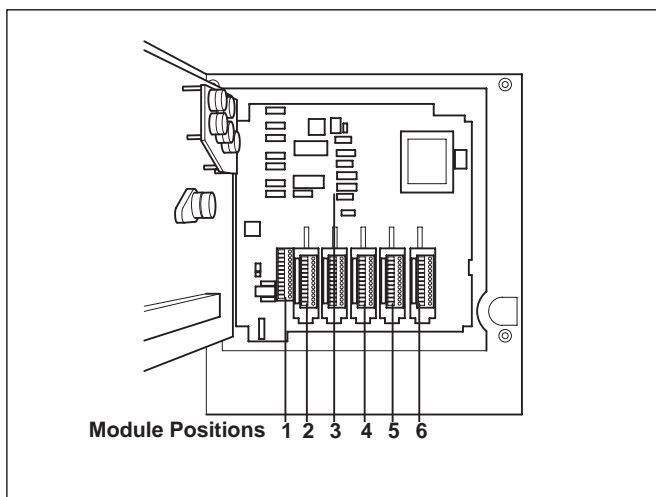
## Ordering Guide

PART 1													
<b>COMMANDER 1900 Recorder/Controller</b>		<b>19 XX</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>XXX</b>
<b>Recorder/ Controllers †</b>	One Control Unit, One Pen (Red)	<b>11</b>											
	One Control Unit, Two Pens (Red & Green)	<b>12</b>											
	One Control Unit, Three Pens (Red, Green, Blue)	<b>13</b>											
	One Control Unit, Four Pens (Red, Green, Blue, Black)	<b>14</b>											
	Two Control Units, Two Pens (Red & Green)	<b>22</b>											
	Two Control Units, Three Pens (Red, Green, Blue)	<b>23</b>											
	Two Control Units, Four Pens (Red, Green, Blue, Black)	<b>24</b>											
<b>Chart Type</b>	Standard (Recorder/Controller)		<b>R</b>										
	KPC105 PX and PXR type charts		<b>S</b>										
	Chessell Brand charts		<b>D</b>										
<b>Electrical Code</b>	Standard			<b>A</b>									
	CSA approved			<b>B</b>									
	UL approved			<b>U</b>									
<b>Option Module</b>	None			<b>0</b>									
	Additional Modules			<b>A</b>									
<b>Options</b>	None				<b>0</b>								
	Totalizer				<b>3</b>								
	Ramp/Soak Profile				<b>5</b>								
	Maths & Timer				<b>A</b>								
	Totalizer, Maths & Timer				<b>B</b>								
	Totalizer, Ramp/Soak, Profile, Maths & Timer				<b>C</b>								
<b>Door Lock</b>	Not Fitted					<b>1</b>							
	Fitted					<b>2</b>							
<b>Power Supply</b>	115V A.C.						<b>1</b>						
	230V A.C.						<b>2</b>						
	24V A.C.						<b>3</b>						
	115V A.C. with On/Off Switch						<b>4</b>						
	230V A.C. with On/Off Switch						<b>5</b>						
	24V A.C. with On/Off Switch						<b>6</b>						
<b>Special Settings</b>	Company Standard											<b>STD</b>	
	Customer Setting											<b>CUS</b>	
	Special											<b>SXX</b>	

† Each pen fitted has an associated standard Input / Output module comprising Analog Input, Analog output, Relay, Transmitter Power Supply and Two Digital Inputs.  
Additional Input / Output modules may be fitted in the unused Module Positions as required. These additional modules should be specified in PART 2 of the Ordering Guide.

### PART 2 Additional Modules

	Module Type							
<b>Module Position 2 / Channel 2 Input *</b>	<b>0</b>	<b>1</b>	<b>2</b>					
<b>Module Position 3 / Channel 3 Input *</b>	<b>0</b>	<b>1</b>	<b>2</b>					
<b>Module Position 4 / Channel 4 Input *</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	
<b>Module Position 5</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>		
<b>Module Position 6</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>5</b>	<b>8</b>			



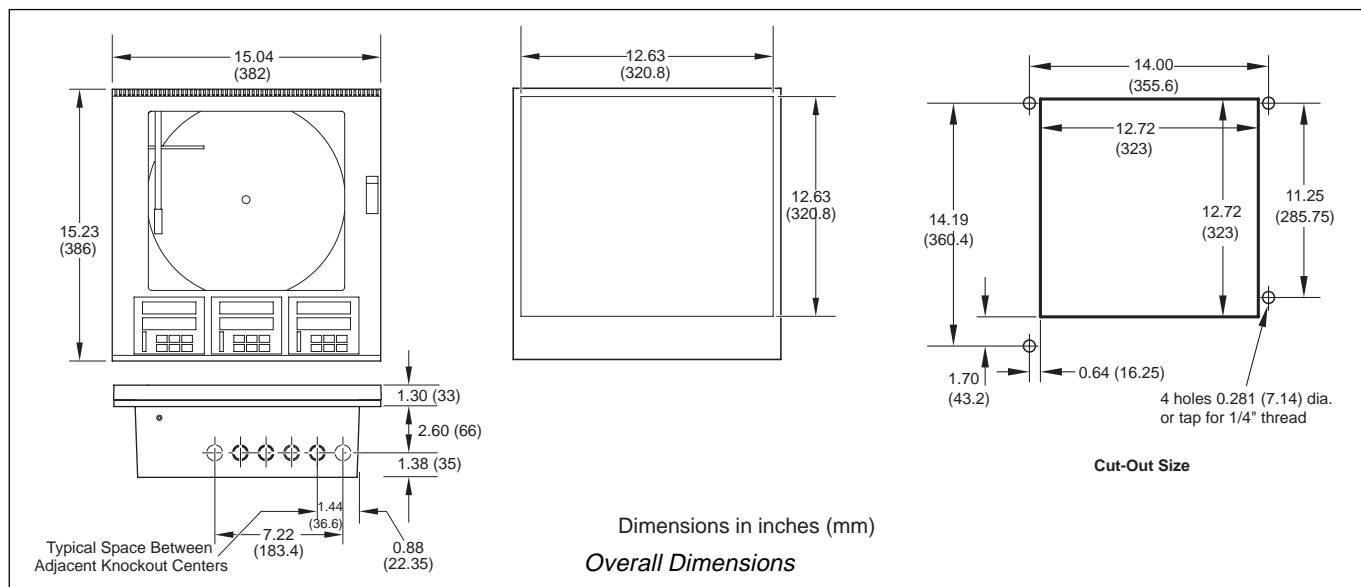
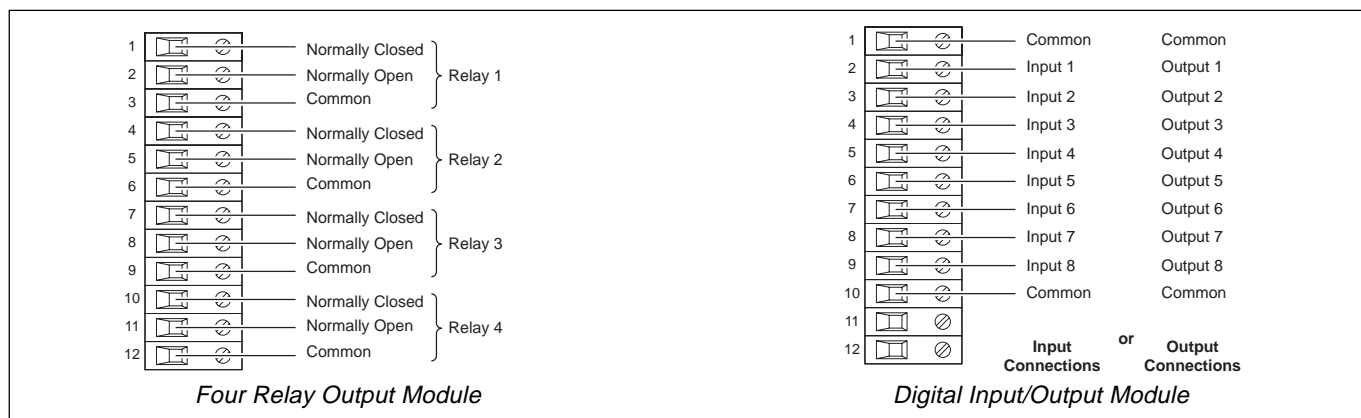
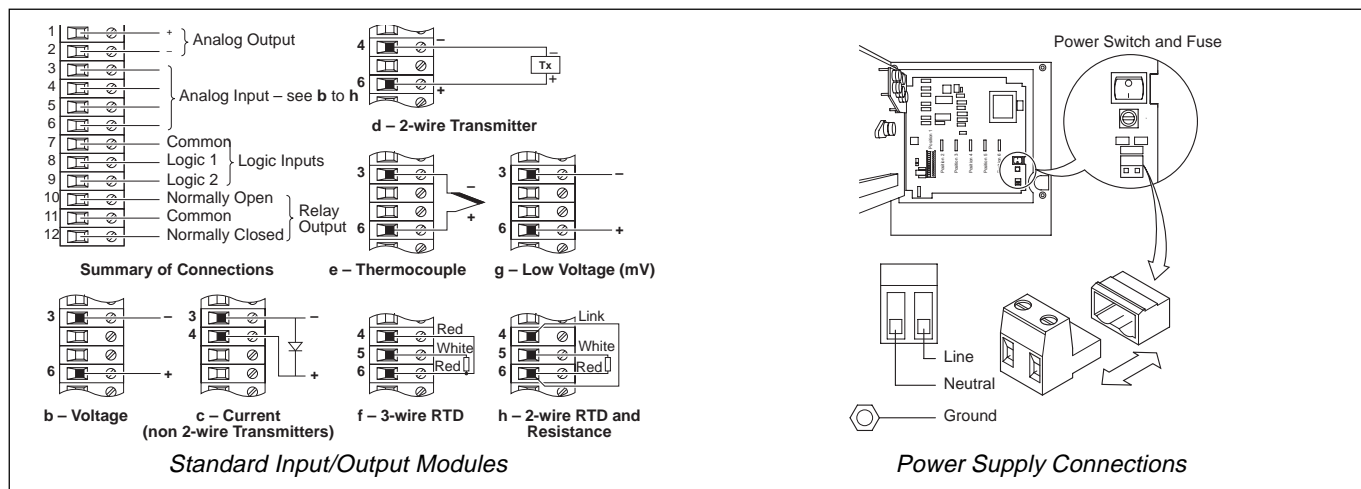
### Key to Module Types

- 0** No module fitted / Pen input channel \*
- 1** Standard Input/Output
- 2** Analog Input (Remote set point)+ Relay
- 3** Four Relays
- 4** Eight Digital Inputs
- 5** Eight Digital Outputs
- 6** True Time Event Pen (Violet)
- 8** MODBUS RS485 Communications

\* On 2, 3 or 4 pen instruments a standard I/O module is always fitted in the corresponding module position (enter '0' in the corresponding order code field).

**Example** 1 9 2 2 R A A 0 1 1 0 2 3 0 0 STD  
 2 control, 2 pen ———  
 Remote set point input ———  
 4 relays ———





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